Investigation Of Antidepressant Activity Of Nardostachys Jatamansi

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ABSTRACT
Nardistachys Jatamansi belongs to the family Valerianaceae have pharmacological actions like hepatoprotective, cardioprotective, hypolipidemic, antidiabetic, antioxidant, antifungal.
Anxiety and Depression are widespread psychiatric disorders affecting around 5% of the population. Furthermore, it is difficult to predict which patient will respond to any given treatment. In the traditional systems of medicine, many plants have been used to treat anxiety and depression for thousands of years. The present study was designed to evaluate the antidepressant activity of the alcoholic and aqueous extracts of *Nardistachys Jatamansi rhizomes* in rodents. The antidepressant activity was tested by using forced swim test and tail suspension test. The results infer that reduced immobility time elicits antidepressant activity. It was concluded that alcoholic and aqueous extracts of *Nardistachys Jatamansi rhizomes* having antianxiety and antidepressant activity. Alcoholic extract of *Nardistachys Jatamansi rhizomes* showing more significant activity over the aqueous extract.

Keywords: *Nardistachys Jatamansi rhizomes*, Antidepressant activity, Elevated, Despair swim test, Tail Suspension Test.

INTRODUCTION

Medicinal plants are various plants thought by some to have medicinal properties, but few plants or their phytochemical constituents have been proven by rigorous science or approved by regulatory agencies such as the United States Food and Drug Administration or European Food Safety Authority to have medicinal effects. World Health Organization (WHO) has provided a definition of medicinal plants, that is "A medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes or which are precursors for synthesis of useful drugs."[1]
World Health Organization (WHO) reported that 80% of the world's population depends on medicinal plants for their primary health care. In the Plant Kingdom, Medicinal plants form the largest single grouping of plants. It is estimated that 30,000 species worldwide fall in this group, of which around 33% are trees [2] Plants are known to be the source of many chemical compounds. Medicinal plants were used by people of ancient cultures without knowledge of their active ingredients. The common practice of taking crude extract orally is laden with hazards as the extracts may contain some toxic constituents. There is an ever increasing need to limit toxic clinical drugs.In modern times, the active ingredients and curative actions of medicinal plants were first investigated through the use of European Scientific methods[3]. The most important ingredients present in plant communities turn out to be alkaloids, terpenoids, steriods, phenols glycosides and tannins[2].
The information obtained from extracts of medicinal plants makes pharmacological studies possible. The mode of action of plants producing therapeutic effects can also be better investigated if the active ingredients are characterized. Infectious diseases are the leading cause of death worldwide. The clinical efficiency of many existing antibiotics is being threatened by the emergence of multidrug resistant pathogens. Bacterial pathogens have evolved numerous defense mechanisms against antimicrobial agents and resistance to old and newly produced drug is on the rise. The increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents has led to the screening of several medicinal plants for their potential antimicrobial activity[4].
There are several reports in the literature regarding the antimicrobial activity of crude extracts prepared from plants [5]. Plants produce a diverse range of bioactive molecules making them a rich source of different types of medicines. Higher plants as sources of medicinal compounds have continued to play a dominant role in the maintenance of human health care since ancient times. Over 50% of all modern clinical drugs are of natural product origin and natural products play a vital role in modern drug development in the pharmaceutical industry[6].

History of plants in medicine [7]

The earliest known medical document is a 4000-year-old Sumerian clay tablet that recorded plant remedies for various illnesses. The ancient Egyptian Ebers papyrus from 3500 year ago lists hundreds of remedies. The Pun-tsao contains thousands of herbal cures attributed to Shennung, China's legendary emperor who lived 4500 years ago. In India, herbal medicine dates back several thousand years to the Rig-Veda, the collection of Hindu sacred verses. The Badianus Manuscript is an illustrated document that reports the traditional medical knowledge of the Aztecs. Western medicine can

be traced back to the Greek physician Hippocrates, who believed that disease had natural causes and used various herbal remedies in his treatments. Early Roman writings also influenced the development of western medicine, especially the works of Dioscorides, who compiled information on more than 600 species of plants with medicinal value in De Materia Medica. Many of the herbal remedies used by the Greeks and Romans were effective treatments that have become incorporated into modern medicine (e.g., willow bark tea, the precursor to aspirin). Dioscorides' work remained the standard medical reference in most of Europe for the next 1500 years.

The beginning of the Renaissance saw a revival of herbalism, the identification of medicinally useful plants. This coupled with the invention of the printing press in 1450 ushered in the Age of Herbals. Many of the herbals were richly illustrated; all of them focused on the medicinal uses of plants, but also included much misinformation and superstition. The Doctrine of Signatures, for example, held that the medicinal use of plants could be ascertained by recognizing features of the plant that corresponded to human anatomy. For example, the red juice of bloodwort suggests that it should be used for blood disorders; the lobed appearance of liverworts suggests that it should be used to treat liver complaints; the "humanoid" form of mandrake root suggests that is should be used to promote male virility and ensure conception.

Many of the remedies employed by the herbalists provided effective treatments. Studies of foxglove for the treatment of dropsy (congestive heart failure) set the standard for pharmaceutical chemistry. In the 19th century, scientists began purifying the active extracts from medicinal plants (e.g. the isolation of morphine from the opium poppy). Advances in the field of pharmacology led to the formulation of the first purely synthetic drugs based on natural products in the middle of the 19th century. In 1839, for example, salicylic acid was identified as the active ingredient in a number of plants known for their pain-relieving qualities; salicylic acid was synthesized in 1853, eventually leading to the development of aspirin. It is estimated that 25% of prescriptions written in the U.S. contain plant derived ingredients (close to 50% if fungal products are included); an even greater percentage are based on semisynthetic or wholly synthetic ingredients originally isolated from plants.

While Western medicine strayed away from herbalism, 75% to 90% of the rural population of the rest world still relies on herbal medicine as their only health care. In many village marketplaces, medicinal herbs are sold alongside vegetables and other Wares. The People's Republic of China is the leading country for incorporating traditional herbal medicine into a modern health care system; the result is a blend of herbal medicine, acupuncture, and Western medicine. Plantations exist in China for the cultivation of medicinal plants, and thousands of species are thus available for the Chinese herbalist; prescriptions are filled with measured amounts of specific herbs rather than with pills or ointments. In India, traditional systems have remained quite separate from Western medicine. In addition to Ayurvedic medicine, which has a Hindu origin, Unani medicine, with its Muslim and Greek roots, is another widely practiced herbal tradition in India. The renewed interest in medicinal plants has focused on herbal cures among indigenous populations around the world, especially those in the tropical rain forests. It is hoped that these investigations will add new medicinal plants to the world's pharmacopoeia before they are lost forever. In addition to the destruction of the forests, the erosion of tribal cultures is also a threat to herbal practices.

Traditional medicine

Traditional medicine is the synthesis of therapeutic experience of generations of practicing physicians of indigenous systems of medicine. Traditional preparation comprises medicinal plants, minerals and organic matters etc. Herbal drug constitutes only those traditional medicines that primarily use medicinal plant preparations for therapy. The ancient record is evidencing their use by Indian, Chinese, Egyptian, Greek, Roman and Syrian dates back to about 5000 years.

About 500 plants with medicinal use are mentioned in ancient texts and around 800 plants have been used in indigenous systems of medicine. Indian subcontinent is a vast repository of medicinal plants that are used in traditional medical treatments[8], which also forms a rich source of knowledge. The various indigenous systems such as Siddha, Ayurveda, Unani and Allopathy use several plant species to treat different ailments [9]. In India around 20,000 medicinal plant species have been recorded recently, but more than 500 traditional communities use about 800 plant species for curing different diseases[10]. Currently 80 % of the world population depends on plant-derived medicine for the first line of primary health care for human alleviation because it has no side effects. Plants are important sources of medicines and presently about 25% of pharmaceutical prescriptions in the United States contain at least one plant-derived ingredient. In the last century, roughly 121 pharmaceutical products were formulated based on the traditional knowledge obtained from various sources. The use of traditional medicine has increased in developed countries also, mainly due to the failure of modern medicine to provide effective treatment for chronic diseases and emergence of multi-drug resistant bacteria and parasites. The adverse effects of chemical drugs, questioning of the approaches and assumptions of allopathic medicine, their increasing costs and greater public access to information on traditional medicine has also led to an increase in interest in alternative treatments (WHO 2002). Plant extracts have become a source of hope as a wide group of medicinal plant preparations are available that have been used over the centuries almost exclusively on the basis of empirical evidence. Hence, it has become necessary to revisit the importance of these herbal medicines.

Traditional medicine is the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures that are used to maintain health, as well as to prevent, diagnose, improve or treat physical and mental illnesses. Traditional medicine that has been adopted by other populations (outside its indigenous culture) is often termed alternative or complementary medicine. Herbal medicines include herbs, herbal materials, herbal preparations, and finished herbal products that contain parts of plants or other plant materials as active ingredients.

Trends of using traditional medicine

In some Asian and African countries, 80% of the population depend on traditional medicine for primary health care. In many developed countries, 70% to 80% of the population has used some form of alternative or complementary medicine (e.g. acupuncture). Herbal treatments are the most popular form of traditional medicine, and are highly lucrative in the international marketplace. Annual revenues in Western Europe reached US$ 5 billion in 2003-2004. In China sales of products totaled US$ 14 billion in 2005. Herbal medicine revenue in Brazil was US$ 160 million in 2007[11].

Modern medicine from medicinal plants

Medicinal plants play a vital role for the development of new drugs. During 1950-1970 approximately 100 plants based new drugs were introduced in the USA drug market including deserpidine, reseinnamine, reserpine, vinblastine and vincristine which are derived from higher plants. From 1971 to 1990 new drugs such as ectoposide, Eguggulsterone, teniposide, nabilone, plaunotol, Z-guggulsterone, lectinan, artemisinin and ginkgolides appeared all over the world. 2% of drugs were introduced from 1991 to 1995 including paciltaxel, toptecan, gomishin, irinotecan etc.

MATERIALS AND METHODS

The designing of methodology involves a series of steps taken in a systematic way in order to achieve the set goal(s) under the prescribed guidelines and recommendations. It includes in it all the steps from field trip to the observation including selection and collection of the medicinal plant, selection of dose value, standardization of protocol, usage of instruments, preparation of reagents, selection of specific solvents for extraction, formation of protocols and final execution of the standardized protocol. All this requires good build of mind and a good and soft technical hand to handle the materials and procedure in a true scientific manner.

Drugs and Chemicals

Drugs and Chemicals used in this study were of analytical grade and of highest purity procured from standard commercial sources in India.

Table : Drugs and Chemicals

S.No	***Materials***	***Company Name***
1.	Diazepam	Nicholos Piramal Ltd
2.	Alcohol	ChangshuYangyuan Chemicals, China.

Instruments

Following instruments were required for the study:

Table No: List of Instruments used for study

Name of the instrument	***Source***
Centrifuge	Dolphin
Digital weighing balance	Horizon
Glucometer	Horizon
Heating mantle	ASGI®
Refrigerator	Videocon
Glass cylinder	ASGI®
Adhesive tape	YVR medivision Pvt Ltd
Thread	YVR medivision Pvt Ltd
Stop watch	ASGI®
Syringes	YVR medivision Pvt Ltd
Needles	YVR medivision Pvt Ltd
Soxhlet extractor	ASGI®
Condenser	ASGI®
Burette stand	Dolphin
Round bottom flask	ASGI® , Amar
Mixer	Videocon
Oven	ASGI®
Water bath	ASGI®
Stirrer/glass rod	ASGI®
Watch glass	ASGI®
Whatmann filter paper	Manipore microproducts, Ghaizabad.
Butter paper	ASGI®
Spatula	ASGI®
Rubber pipes	ASGI®

Experimental animals
Wistar rats (150-200 g) and Swiss albino mice (18-22g) of either sex selected for the study. Animals were housed in appropriate cages in uniform hygienic conditions and fed with standard pellet diet (Amrul Laboratory Animal Diet) and water ad libitum. All the animals were maintained under standard conditions, that is room temperature 26 ± 1°C, relative humidity 45 - 55% and12:12 h light – dark cycle. Animal studies had approval of IAEC.

Plant Material Collection
The rhizomes of *Nardystachys Jatamansi* was collected from the local market in the month of march and was identified and authenticated from Department of Botanay Thirupathi.The plant material was cleaned, reduced to small fragments, air dried under shade at room temperature and coarsely powdered in a mixer. The powdered material was stored or taken up for extraction process.

Preparation of plant extracts
Preparation of Aqueous Extract:
Fresh rhizomes of *Nardystachys Jatamansi* were collected and washed under tap water. The rhizomes extract used was prepared by taking 20gms of finely cut roots into 250ml beaker containing 200ml of water. The contents were mixed well and then the mixture was boiled upto 80-100^{0}C for 4-5hrs. Further the extract was filtered with whatmann filter paper. The filtrate was boiled until the concentrated residue is formed. The concentrated product was sealed in sample covers and stored under room temperature and used for further experiment to check the activities.

Preparation of Alcoholic Extract:
Fresh rhizomes of *Nardystachys Jatamansi* were collected and washed under tap water. The rhizomes extract used was prepared by taking 20gms of finely cut rhizomes into 250ml beaker containing 200ml of alcohol. The contents were mixed well and then the mixture was boiled upto 50-60^{0}C for 4-5hrs. Further the extract was filtered with whatmann filter paper. The filtrate was boiled until the concentrated residue is formed. The concentrated product was sealed in sample covers and stored under room temperature and used for further experiment to check the activities.

Preliminary Phytochemical Analysis:
The extracts of *Nardostachys jatamansi*, was subjected to preliminary phytochemical tests for the presence or absence of phytoconstituents by the following methods.

a) Detection of alkaloids:
About 50 mg of solvent-free extract was stirred with little quantity of dilute hydrochloric acid and filtered. The filtrate was tested carefully with various alkaloid reagents as follows.

i) Mayer's test:
To a few ml of filtrate, two drops of Mayer's reagent was added along the sides of the test tube. Formation of white or creamy precipitate confirms the test as positive.
ii) Wagner's test:
To a few ml of filtrate, few drops of Wagner's reagent were added along the sides of the test tube. Formation of reddish brown precipitate confirms the test as positive.
iii) Hager's test:
To a few ml of filtrate, 1 or 2 ml of Hager's reagent was added. A prominent yellow precipitate indicates positive test.
iv) Dragendroff's test:
To a few ml of filtrate, 1 or 2 ml of Dragendroff's reagent was added. A prominent reddish brown precipitate indicates positive test.
b) Detection of carbohydrates:
About 100 mg of the extract was dissolved in 5 ml of distilled water and filtered. The filtrate was subjected to the following tests.
i) Molisch's test:
To 2 ml of filtrate, two drops of alcoholic solution of □–naphthol was added. The mixture was shaken well and 1 ml of concentrated sulphuric acid was added slowly along the sides of the test tube. The test tube was cooled in ice water and allowed to stand for few minutes. A violet ring at the junction indicates the presence of carbohydrates. **ii) Fehling's test:** 1 ml of filtrate was boiled on a water bath with 1 ml each of Fehling's solution A and B. Formation of red precipitate indicates the presence of sugars.
iii) Barfoed's test:
To 1 ml of the filtrate, 1 ml of Barfoed's reagent was added and boiled on a boiling water bath for 2 minutes. Red precipitate indicates the presence of sugars.
iv) Benedict's test:
To 0.5 ml of filtrate, 0.5 ml of Benedict's reagent was added. The mixture was heated on a water bath for 2 minutes. Red precipitate indicates the presence of sugars.

c) Test for steroids:

i) Libermann burchard test

When Small quantities of extracts were treated with concentrated sulphuric acid, few drops of glacial acetic acid, followed by the addition of acetic anhydride, appearance of green color indicates the presence of steroids.

d) Test for proteins:

i) Biuret's– test

When Small quantities of extracts were treated with copper sulphate solution, followed by the addition of sodium hydroxide solution, appearance of violet color indicates the presence of proteins.

ii) Millon's–test

When Small quantities of extracts were treated with Millon's reagent, appearance of pink color indicates the presence of proteins.

e) Test for tannins:

i) When Small quantities of extracts were treated with 10% lead acetate solution, appearance of white precipitate indicates the presence of tannins.

ii) When Small quantities of extracts were treated with aqueous bromine solution, appearance of white precipitate indicates the presence of tannins.

F) Test for phenols:

i) When Small quantities of extracts were treated with neutral ferric chloride solution, the appearance of violet color indicates the presence of phenols.

ii) When Small quantities of extracts were treated with 10% sodium chloride solution, the appearance of cream color indicates the presence of phenols.

g) Test for flavanoids:

i) 5 ml of the each extract was hydrolyzed with 10 % v/v sulphuric acid and cooled. Then, it was extracted with diethylether and divided into three portions in three separate test tubes. 1 ml of diluted sodium carbonate, 1 ml of 0.1N sodium hydroxide, and 1ml of strong ammonia solution were added to the first, second and third test tubes respectively. In each test tube, development of yellow color demonstrated the presence of flavonoids.

Shinoda's test:

Small quantities of extracts were dissolved in alcohol, to that one piece of magnesium followed by conc. HCl were added dropwise and heated. Appearance of magenta color shows the presence of flavonoids.

h) Test for gums and mucilage:

Small quantities of extracts were treated with 25 ml of absolute alcohol, and then solutions filtered. The filtrates examined for its swelling properties.

i) Test for glycosides:

When a pinch of the extracts were dissolved in the Glacial acetic acid and few drops of ferric chloride solution was added, followed by the addition of concentrated sulphuric acid, formation of red ring at the junction of two liquids indicates the presence of glycosides.

j) Test for saponins:

i) Foam test:

1ml of the each extract was diluted to 20 ml with distilled water and shaken well in a test tube. The formation of foam in the upper part of the test tube indicates the presence of saponins.

k) Test for terpenes: When Small quantities of extracts were treated with Tin and thionyl chloride, appearance of pink colour indicates the presence of terpenes.

L) Test for Sterols:

When Small quantities of extracts were treated with 5% KOH solution, appearance of pink color indicated the presence of sterols.

Selection of dose for animal study

The dose considered for the experiment on rats was obtained from conversion of human dose of *Nardystachys Jatamansi* (3-5 g/kg). The conversion factor of human dose (per 200 g body weight) is 0.018 for rats and 0.002 for mice (Ghosh 1984). Hence the calculated dose for the rats (considering human dose3 and 5 g/kg) is 200 mg/kg and for mice is 20 mg/kg. Acute toxicity was done at dose of 2000mg/kg body weight.

Pharmacological evaluation

Preparation of extracts:

The aqueous and alcoholic extracts of *Nardystachys Jatamansi* suspended in water in presence of 3%v/v Tween-80 solution.

All the drugs were administered orally for experimental purpose. Each time preparations of the extracts were prepared when required. The drugs were administered at a constant volume of 10ml/kg for each animal.

ACUTE ORAL TOXICITY:

The acute oral toxicity of aqueous and alcoholic extracts of *Nardystachys Jatamansi* was determined by using rats and mice which were maintained under standard conditions. The animals were fasted 12 hour prior to the experiment, up and down procedure OECD guideline no. 425 were adopted for toxicity studies. Animals were administered with single dose of individual extract upto 2000mg/kg and observed for its mortality during 2days and 7days study period (short term) toxicity and observed upto 7days for their mortality, behavioral and neurological profiles.

Procedure for Antidepressant Activity

- **Despair Swim Test Apparatus**

For the determination of antidepressant activity, forced swim test (FST) protocol was employed. During the test, animals were individually placed in a glass cylinder (20 cm in height, 14 cm in diameter) filled with water up to a height of 10cm, at 25 ± 2°C. All animals were forced to swim for 5 min and the duration of immobility was observed and measured during the 5 min interval of the test. Immobility period was regarded as the time spent by the rats to float in water with no struggle and making only those movements necessary to keep its head above the water. In order to check the fitness level of each test animal, a pre-test was carried out 24 h before the FST by subjecting each test animal to a session of 15 min swimming.

- **Tail suspension test**

Tail suspension test was performed based on the method prescribed17. The mice were suspended 58cm above the floor by means of an adhesive tape, placed approximately 1cm from the tip of the tail. The total duration of immobility was quantified during a test period of 5min. Mice were considered immobile when they were completely remain motionless

Statistical analysis

The values were expressed as mean ± SEM data was analyzed using one-way ANOVA followed by T-test. Two sets of comparision had made. i.e. Normal control Vs All treated groups. Differences between groups were considered significant at P<0.001 and $P < 0.05$ levels.

RESULTS

PRELIMINARY PHYTOCHEMICAL SCREENING:

AQNJ, and ALNJ, subjected to preliminary phytochemical screening.AQNJ has showed the presence of alkaloids, carbohydrates, proteins, steroids, sterols, tannins, flavonoids, gums and mucilage, glycosides, saponins and terpenes. Table: below

ALNJ has showed the presence of carbohydrates, steroids, sterols, flavonoids, gums & mucilage and terpenes. Table: below

Table: Preliminary phytochemical analysis of ALNJ

Sl. No.	Phytochemical Tests	Inference
1	Test for Alkaloids	+VE
2	Test for Carbohydrates	+VE
3	Test for Proteins	+VE
4	Test for Steroids	+VE
5	Test for Sterols	+VE
6	Test for Phenols	- VE
7	Tannins	- VE
8	Test for Flavonoids	+ VE
9	Test for gums and mucilage	+ VE
10	Test for Glycosides	+ VE
11	Test for Saponins	+ VE
12	Test for Terpenes	+ VE

+ Ve: indicates the presence of compounds.
-Ve: indicates the absence of compounds.

Table: Preliminary phytochemical analysis of AQNJ

Sl. No.	Phytochemical Tests	Inference
1	Test for Alkaloids	+VE
2	Test for Carbohydrates	+ VE
3	Test for Proteins	- VE
4	Test for Steroids	+ VE
5	Test for Sterols	+ VE
6	Test for Phenols	- VE
7	Tannins	+ VE
8	Test for Flavonoids	+ VE
9	Test for gums and mucilage	+ VE
10	Test for Glycosides	+ VE
11	Test for Saponins	- VE
12	Test for Terpenes	+ VE

+ Ve: indicates the presence of compounds.
-Ve: indicates the absence of compounds

ANTIDEPRESSANT ACTIVITY OF NARDYSTACHYS JATAMANSI

➢ FORCED SWIM TEST

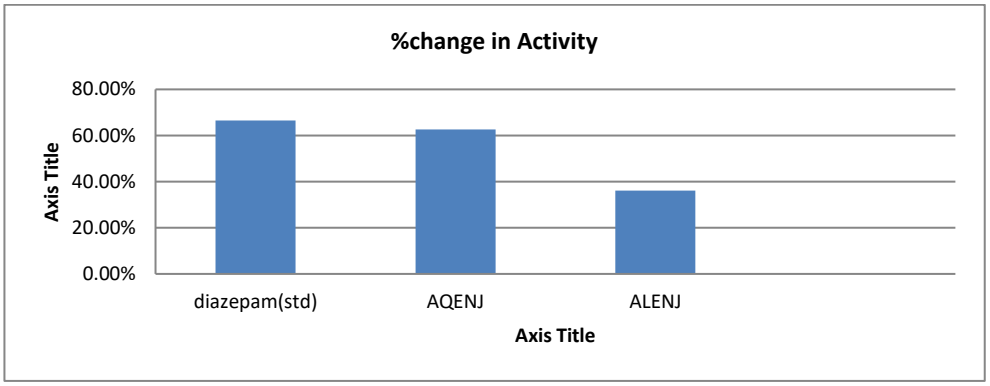
Antidepressant activity of aqueous and alcohol solvent soluble fraction of the rhizomes of *Nardystachys Jatamansi* studied at a dose of 200 mg/Kg, using Forced Swim Test experiment.

The anti-depressant activity of AQENJ and ALENJ was assessed using Forced Swimming Test in Swiss albino rats were illustrated in Table No:---. It was observed that AQENJ and ALENJ at a dose of 200mg/kg exhibited significant reduction in immobility time when compared to control in dose dependent manner. Similarly the animals treated with diazepam (10mg/kg) as expected showed significant decrease in immobility time.

Table No: ---. Effect of extracts of *Nardystachys Jatamansi* on Anti-depressant activity.

S.No	Group	Dose(i.p; mg/kg)	Immobility period		% change in activity
			Before	After	
1	**Control**	**5ml/kg**	134	--	---
2	**Diazepam**	**10mg/kg**	185	62	66.48%
3	**AQENJ**	**200mg/kg**	179	67	62.6%
4	**ALENJ**	**200mg/kg**	305	195	36.06%

The results are expressed as means ± S.E.M Differences in mean values between groups were analyzed by a one-way analysis of variance (ANOVA). Statistical significance was assessed as $p < 0.05$.



Graph-1: Effect of extracts of *Nardystachys Jatamansi* on Anti-depressant activity

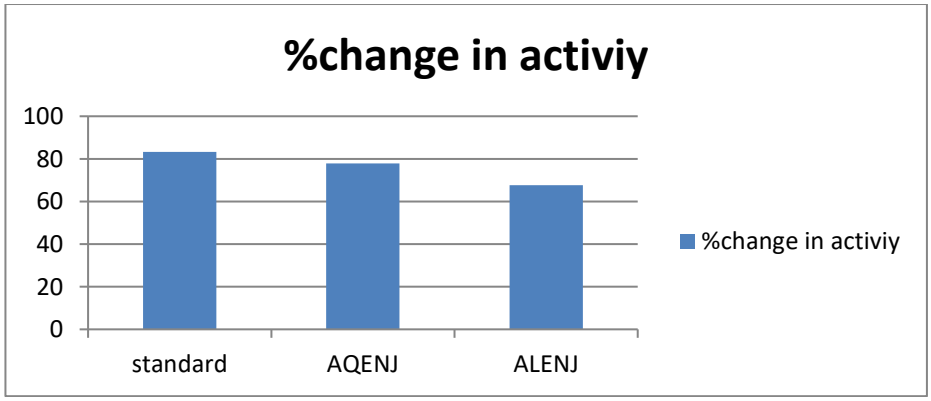
➢ TAIL SUSPENSION TEST

Antidepressant activity of aqueous and alcohol solvent soluble fraction of the rhizomes of *Nardystachys Jatamansi* studied at a dose of 200 mg/Kg, using Forced Swim Test experiment.

In tail suspension test, the alcoholic and aqueous extracts of rhizomes of *Nardystachys Jatamansi* at a dose of 200 mg/kg i.p. significantly decreased the immobility time. The magnitude of the antidepressant effects of 200 mg/kg i.p. of alcoholic and aqueous rhizomes of *Nardystachys Jatamansi* was comparable to that of Diazepam 10 mg/kg i.p. (Table ---)

Effect of Ethanolic and Aqueous Extracts of *Nardystachys Jatamansi* Rhizomes on Tail Suspension Test in Mice at Different Time Intervals

S.No	Treatment	Dose (mg/kg)	Duration of immobility		%change in activity
			Before	After	
1.	Control	---	40	-----	------
2.	Standard	10	20	120	83.33%
3.	AQEDB	200	40	180	77.8%
4.	ALEDB	200	54	167	67.7%



Graph-1: Effect of extracts of *Nardystachys Jatamansi* on Anti-depressant activity on Tail Suspension Test.

DISCUSSION

1. PHYTOCHEMICAL ANALYSIS:

Preliminary phytochemical studies confirmed the presence of alkaloids, carbohydrates, proteins, steroids, sterols, tannins, flavonoids, gums and mucilage, glycosides, saponins and terpenes in AQNJ, alkaloids, carbohydrates, steroids, sterols, tannins, flavonoids, gums and mucilage, glycosides and terpenes in ALNJ

2. BEHAVIOURAL ACTIVITIES

ANTI-DEPRESSANT ACTIVITY

TAIL SUSPENSION TEST

Open field behavioral model was used to study exploratory and locomotor activity in this investigation. Reported studies have shown that stress factors account for the decreases in mobility and functional responses against novel environment. The purpose of including this test was to assess the general activity of the animals after performing FST. The results observed in the open field test showed that i.p administration of aqueous and alcoholic extracts of *Nardistachys Jatamansi*(200 mg/kg) did not significantly increase the locomotor activity in unstressed groups of rats as compared with their control groups. However, aqueous and alcoholic *Nardistachys Jatamansi* administered rats following the exposure to repeated restraint stress showed significant ($p<0.01$) increases in locomotor / exploratory activity on an open field arena. It is therefore, suggested that the extract has the ability to reverse or normalize the locomotor suppressant behavior in laboratory animals and hence may help to cope with immobility factor associated with depression in humans. In the present study that administration of aqueous and alcoholic *Nardistachys Jatamansi* at the dose of 200 mg/kg significantly altered the behavioral deficits induced by injections of atypical neuroleptic, haloperidol and increased brain serotonin metabolism in mice. The results are in general agreement with our previous studies in continuation to this plant and indicating its antidepressant-like activity in behavioral models of depression.

FORCED SWIM TEST

Mood disorders are one of the most common mental illnesses, with a lifetime risk of 10% in general population. Prevalence of depression alone in general population is estimated to be around 5% with suicide being one of the most common outcomes. Commonly used Antidepressants often cause adverse effects, and difficulty in tolerating these drugs is the most common reason for discontinuing an effective medication, for example the side -effects of Selective Serotonin Reuptake Inhibitor (SSRIs) include: nausea, diarrhea, agitation, headaches. Sexual side-effects are also common with SSRI's. The Food and Drug Administration requires Black Box warnings on all SSRIs, which state that they double suicidal rates (from 2 in 1,000 to 4 in 1,000) in children and adolescents. Side effects of Tricyclic Antidepressants (TCA's) include drowsiness, anxiety, emotional blunting (apathy/anhedonia), confusion, restlessness, dizziness, akathisia, hypersensitivity, changes in appetite and weight, sweating, sexual dysfunction, muscle twitches, weakness, nausea and vomiting, hypotension, tachycardia, and rarely, irregular heart rhythms.

In the present study we have evaluated the antidepressant activity of *Nardistachys Jatamansi* of both aqueous and alcoholic extracts in FST. The development of immobility when rodents are placed in an inescapable cylinder of water during FST reflects the cessation of their persistent escape-directed behavior. Conventional drugs reliably decrease the duration of immobility in animals during this test. This decrease in duration of immobility is considered to have a good predictive value in the evaluation of potential antidepressant agents. Exact mechanisms underlying the antidepressant action cannot be concluded at the moment due to the presence of large number of Phytochemicals in the *Nardistachys Jatamansi*. However, the antidepressant activity may be attributed to the presence of saponins, flavonoids and tannins in the extract. It is possible that the mechanism of anxiolytic action of AQENJ and ALENJ could be due to the binding of any of these phytochemicals to the $GABA_A$ -BZD_S complex.

SUMMARY

1. The fresh rhizomes of *Nardistachys Jatamansi* used for this project work were supplied by suralabs in the month of march.
2. The dried rhizomes of *Nardistachys Jatamansi* were successively extracted with alcohol and water. Percentage yield was calculated.
3. Therapeutic dose of the extracts were calculated after carrying acute oral toxicity studies in both rats and mice.
4. Extracts were tested for their anti-depressant activity in mice.

- By Forced Swim Test.
  - Both aqueous and alcoholic extracts (200 mg/kg) showed significant decrease in duration of immobility time.
- By Tail-Suspension Test.
  - Both aqueous and alcoholic extracts (200 mg/kg) showed significant decrease in duration of immobility time.

CONCLUSION

The results obtained in this study indicate that the aqueous and alchoholic fractions of the rhizomes of *Nardistachys Jatamansi* have significant CNS Depressant activities in animal model systems. The medicinal values of the plant leaves may be related to their constituent phytochemicals. So, further detailed investigations are needed to isolate and identify the active compounds present in the plant extract and its various fractions and their efficacy need to be done. It will help in the development of novel and safe drugs for the treatment of different types of CNS disorders.

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